

VOYAGER

SCIENCE STEERING GROUP

May 20, 1988

Summary Report

The single object of the May SSG meeting was to review and discuss the NE Integrated Timeline Product. Attachment 1 presents the agenda for the meeting. Copies of the attachments can be obtained from Pieter deVries or from the respective Principal Investigators or Team Leaders. Len Tyler introduced Dr. Tadashi Takano, the visiting ISAS researcher from Japan.

Project Status

Norm Haynes reported that NASA had borrowed \$2.5 million from Voyager this year. Voyager has requested that money back by FY90, but that has not yet been finalized.

NASA is also reviewing Mission Operations and Data Analysis costs for all missions from FY90 onward and has requested that lower cost options be developed for the Voyager Interstellar Mission. Headquarters is planning a 3-phase cost review of all planetary MO and DA costs in May and June.

Headquarters Status

William Brunk reported that Voyager's budget at Goddard will be reduced by about 11%, corresponding to the Institutional Management Services charge. Instead, those funds will now be supplied by Headquarters directly.

Ed Stone distributed a list of scientists that are associated with each instrument and asked that the list be updated by each PI.

Operations Status (Attachment 2)

Ann Harch presented the operations report. Major points are outlined below.

- o The LECP power anomaly investigation is continuing.
- o The tests to get the Voyager 1 PLS working are continuing. Further tests are proposed for Load A815 (not A813 as stated in handout).
- o Miscellaneous calibrations were performed on Voyager 2. Further tests were proposed for MAG.
- o Coding of VIM-5 high rate is essentially complete. To allow for testing, ground software modifications by PIs must be complete by the uplink of the program. The date is yet to be determined, but PIs should be ready for data by mid 1990.
- o NIMC tests are continuing.
- o The FDS counter on Spacecraft 32 is to be reset on August 10, 1988.

Near Encounter Integrated Timeline (Attachment 3)

Randii Wessen reported on the Near Encounter Integrated Timeline Product. The resource summary showed that for B951, 2218 CCS words were used out of a possible 2228 allocated for the end of IT, and for B952, 1348 words were used.

Near Encounter Issues (Attachment 4)

Ellis Miner reported on Near Encounter issues and made recommendations for their resolutions.

- o To handle the overage in CCS word usage, earlier cuts resulted in the deletion of all priority 3 observations except RPNSMAP. He recommended that ISS cut costs by at least another 5 CCS words.
- o To avoid violating Flight Rule FR07B12, which prohibits pointing optical instruments within 80 degrees of incoming particles during ring plane crossing, the UPKAPSCO and VRXING1 observations were deleted and a medium-rate El only slew and a low-rate Az slew were used to get the platform to a safe position. To avoid potential damage at ring crossings, LECP has stopped stepping for 40 minutes inbound and for 52 minutes outbound.
- o To protect against FDS Power-On-Reset effects caused by a potentially strong radiation field, it is recommended that there be a 10 second delay of DMode, SC, ST, and slew commands.
- o An SLO rate of 0.0089 degrees/second was proposed as one of two Maneuverless Image Motion Compensation rates. This would replace the current High Rate on the spacecraft and be used as MIMC for VRHIPHAS and RTATM. VRXING2 will use the existing VLO rate for its MIMC. However, some design issues remain for these observations, particularly for RTATM. Initial testing of software for MIMC at VLO on RTATM looks very promising.
- o Only one major issue remains for the two stellar occultations: PPS configuration timing during the Beta Canis Majoris occultation by Triton. A late update of the timing may be required to avoid PPS damage.
- o The DTR strategy-and loading is detailed in a memo included with the NE IT product. All 8 tracks of the recorder are used and all critical data are played back twice. There is no DTR margin: a slight reduction in usage would be prudent.
- o Criteria for movable-block placement were recommended: place the Vernier Movable Block such that the Earth Occultation Ingress timing is correct to the nearest second, place the Neptune Movable Block to minimize NMB shift relative to the VMB, and place the Triton Movable Block to preserve the timing of Triton sun/earth occultation events.
- o Medium rate slewing totals are near the levels successfully used at Uranus and, as per project management recommendation, there is no medium rate slewing before the -3 hour VTLO (full-frame Triton).
- o It was recommended that roll gyro position sampling remain at 12 seconds. It is not clear how much improvement in attitude reconstruction would be provided by an increased sampling rate, and there would be a CCS cost of 8 words.

- o More rapid gyro-drift-turn response can be achieved by changing from 4-msec to 10-msec AACS pulses during the limbtrack maneuver. The UVS team desires steadier pointing for the solar occultations and therefore would like to start 10-msec pulsing as late as possible; however, starting 10-msec pulsing at E-5 minutes should not have a severe impact.
- o There is very little quiet time in B951. This may severely limit changes during FT development and at updates. Adding observations would possibly require cutting science because of this lack of quiet time. However, slews have been artificially lengthened by 48 seconds each to permit potential growth.
- o It was determined that the mosaic designs for RPLATSCN and RPLONSCN were utilizing more than the allowed number of steps. The problem was recommended to be resolved by using the last 8 CCS words of the IT margin to put in 2 additional scan calls.
- o Solutions for an accurate simulation of the VRMOS1 observation are continuing to be pursued.
- o VTMAP design could be degraded by trajectory dispersions. It was recommended that another position slew be added about midway into the observation to improve the chances of avoiding gores in the observation. CCS cost would be an additional 3 words.

Neptune Delivery And Knowledge Uncertainties (Attachment 5)

Don Gray reported on the uncertainties inherent in the Triton encounter. Even with TCMB19 and TCMB20, there is still a differential dispersion of up to 4 NA frames from the start to the end of the VTMAP. If one of these TCMS were removed, the dispersion could be even larger. Adding PSLEWs would help alleviate the accumulated drift problems of the VTMAP.

NE IT Comments And Discussion (Attachment 6)

Investigators made the following comments:

- o ISS would like to keep trajectory dispersions to a minimum with TCMS and will study the effects of adding position slews to the VTMAP.
- o IRIS was generally happy with the current status and B. Conrath would like to add the scans to RPLATSCN and RPLONSCN as recommended. The IRIS team will also study the possibility of removing RPOCCPT from the list of retargetable observations and has some ideas concerning protecting RTATM against trajectory dispersion problems.
- o PPS was generally pleased with the sequence but expressed some concerns. L. Lane believes that NIMC during the -2 hour VTLOn could cause substantial loss for PPS. There was also a desire to obtain color coverage in PPVPHOTs #3 and #4, but they will accept the present design, which includes a second filter only in PPVPHOT #5. The POR problem is still an issue and PPS will need to study the effects of the proposed strategy. PPS also requires that the J-mode off configuration for PTBETCMA occur after the 1-degree FOV is safely across Triton's illuminated crescent.
- o UVS reported that a 4-msec pulse width is preferable to a 10-msec pulse width during the UPHOCC observations, but that UVS can't present a strong argument against switching to 10-msec pulsing partway through the observation.

- o RSS expressed general satisfaction with the product but listed some concerns. L. Tyler expressed a need to have more calibration data available to get a better understanding of BLF to ensure that 2-way data is available during and following NIMC observations. It would be helpful to have both the 10-msec thruster pulse width and the 4 second pitch and yaw gyro position sampling rate during the limbtrack maneuver. Concern was expressed over whether the 4 minutes between the Neptune and Triton movable blocks was enough time to permit independent movement of the Triton movable block.
- o MAG indicated a preference for 4-second roll gyro position sampling during Neptune occultations in addition to the presently planned 4-second pitch and yaw sampling.
- o PLS indicated a concern over getting out of sync with LECP stepping because of the POR situation. J. Belcher expressed satisfaction with the current roll strategy.
- o CRS, LECP, PRA, and PWS expressed satisfaction with the product.

The next SSG meeting is scheduled for Thursday, September 29, 1988.

JET PROPULSION LABORATORY

INTEROFFICE MEMORANDUM
VOYAGER-APH-88-006

May 23, 1988

TO: VIM-7 Experiment Representatives

FROM: Ann Harch 

SUBJECT: VIM-7 FDS Program Development

Please inform the investigators who are cognizant of VIM Program Development that the science requirements definition inputs phase for the VIM-7 program has begun. The Advanced Software Development Team (ASDT) has asked that we deliver the initial science desires by June 17th or earlier if possible. I realize this is a short amount of time, however this will be an iterative process. The ASDT will evaluate the requests and return detailed option descriptions.

The entire process should be simpler than VIM-5 development since there are no high-rate data modes and there will be no DTR utilization. UVS will not be included in the VIM-7 mission due to power utilization and thermal considerations. The VIM-7 program will be very simple. It will contain a low-rate cruise data mode (CR-7 derivative) with a downlink bit-rate of $46 \frac{2}{3}$ bps, and a single engineering mode (EL-40). Nominally the VIM-7 program will be used after the 160 bps Reed Solomon coded CR5T can no longer be recovered by the DSN. VIM-7 may also serve as a contingency FDS program, allowing recovery of cruise science in the event of an FDS memory failure or X-Band transmitter failure.

As with VIM-5 there is the opportunity to request instrument processing changes for the basic cruise mode. Keep in mind however that we still face some of the same constraints which we had to contend with during VIM-5 development. The two largest considerations are programmer resources, and the severely limited downlink rate of $46 \frac{2}{3}$ bps. Ground Data System adaptation considerations are not an issue here since SFOC will have long since replaced the Voyager TTS by the time VIM-7 is uplinked. FDS memory space is more limited than in VIM-5 since the plan is to fit the entire program into an FDS memory half to safeguard against an FDS memory failure. The point is that although the door is open to changes, please request changes only where it is necessary, and be prepared to justify the requests.

As you are aware there currently exists a set of CR-7 processing schemes which were developed several years ago. Minor frame instrument bit allocations for those schemes are as follows:

MAG	280	
PRA	100	
CRS	432	
PWS	64	
PLS	352	
LECP	320	

Total	1548	per 48 second minor frame

The total science minor frame bit allocation is 1684 bits (in 48 seconds), which means there are 136 unallocated bits.

We recommend that the investigators each design a set of requirements which lives within their instrument's current budget. If there are capabilities desired which cannot be accommodated by the above budget, these should be defined as well. It is strongly recommended that written justification accompany the desirements.

We are available to answer questions any time.

APH:lj1

Distribution:

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RECEIVED

JPL

JUN 7 1990

MICHAEL ORR

5 June 1990

*June 15, 1990
John Hatten*

Dear Voyager Investigators:

As of June 4, 1990, Voyager 2 has been returning data in the new VIM-5 formats. To help you with your VIM-5 EDR software checkout, we have sent you two QEDR tapes by express shipment. One of the tapes contains the first pass of VIM-5 data in the CR-5T/CR-5A format. The second tape contains the last CR-5 data from the period before the transition to VIM-5.

The QEDR for the last CR-5 data covers the period from hour 0600 to hour 1500 (ERT) on day 155 of year 1990. The tape numbers are:

CRS = H2504D	PRA = H2427F 23466
LECP = I2721C	PWS = H2519C
MAG = H2404I	UVS = C2655C
PLS = H2481C	

The QEDR for the first VIM-5 data covers the period from hour 1624 to hour 2130 (ERT) on day 155 of year 1990. These tape numbers are:

CRS = L2698C	PRA = F2920C 23467
LECP = L2513C	PWS = L2609B
MAG = L2594B	UVS = L2691B
PLS = F2836B	

If you have any comments or questions concerning these QEDRs, please contact me at (818) 354-1021 or by mail at:

M/S 264-235	U. S. Mail
JPLGP::NTOY	SPAN
NTOY	NASAMAIL

The project expects a report on the test results back from the science teams as soon as possible. Please send your report to me or to your experiment representative.

Yours truly,

Neil Toy

Neil Toy

NT:lj

Voyager Investigators

5 June 1990

Page 2

cc: O. Divers
S. Linick
R. Poynter
E. Franzgrote
M. Orr
J. Schmidling
R. Hungerford
G. Textor
G. Spradlin
R. Rudd

CRS: E. Stone
N. Lal
R. Selesnick

LECP: S. M. Krimigis
E. Keath

MAG: N. Ness
R. Lepping

PLS: J. Belcher
G. Gordon

PRA: J. Warwick
D. Evans
M. Kaiser

PWS: D. Gurnett
W. Kurth

UVS: L. Broadfoot
T. Forrester
R. Polidan

65668

H. Peterson

DATA MANAGEMENT TEAM/SCIENCE DATA TEAM

QEDR/REMAKE PROCESSING REQUESTCRS, LECP, MAG, PLS, PRA, PWS, UVSINSTRUMENT: _____ S/C ID: 32 REQ. NO. G-583START PROCESSING: YR: 1990 DAY: 165 HR: 14 MIN: 30STOP PROCESSING: YR: 1990 DAY: 165 HR: 17 MIN: 30DATA MODE(S): UV-SA 6/14/90

TAPE DISPOSITION:

FEDERAL EXPRESS TOPI

OTHER EXPRESS TO: _____

NEXT REGULAR SHIPMENT TO: _____

JEL HOLD FOR: _____

REQUESTED BY: R. Hungerford DATE: 6/14/90COMMENTS: FIRST UV-SA data.
Please FAX numbers to Hungerford

FOR DMT USE ONLY: DATA SOURCE: SUR: _____ MDR: _____ SHORT: _____

TAPES NUMBERS: NORTJOB NAME: G583UVSA PROCESSED BY: BJOUTPUT TAPE NO: ↓ SHIPPING DATE: _____CRS = C2563B 23468. PLS = C2542C
LECP = C2561F PRA = B2728B + I2469A (GODDARD)
MAG = C2539C PWS = B2767A
UVS = B2779B

August 3, 1990

To: Voyager Investigators
RE: SEDR for the New Neptune Satellites

Dear Colleagues,

This shipment contains three tapes with the reel numbers, 095S1, 095S2, and 095S3. These special SEDRs, which the MAG team has requested, has the new Neptune satellites N1 through N6. Each tape covers the three days of year 236, 237, and 238. These SEDRs contain data records at 4 minute intervals. The SEDRs are generated from the NAV L' final reconstruction trajectory and physical constants. These are the same files used in generating the final SEDR for Neptune encounter.

Each tape provides the SEDR for two satellites. The SEDRs are identical in format to the SEDR for Neptune encounter. SEDR parameters for the two satellites are in the respective word locations reserved for Triton and Nereid in the navigation block of the Neptune encounter SEDR.

Tape #095S1 contains N1 (S1150A) in the "Triton" locations and N2 (S0730A) in the "Nereid" locations.

Tape #095S2 contains N3 (S0540A) in the "Triton" locations and N4 (S0620A) in the "Nereid" locations.

Tape #095S3 contains N5 (S0500A) in the "Triton" locations and N6 (S0500B) in the "Nereid" locations.

A word of caution, since the poles and prime meridians are not available for these satellites, any longitudinal systems centered at these satellites are invalid.

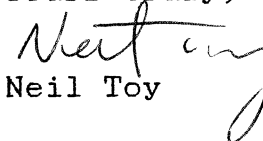
The location of some selected parameters are as follows.

The range from Neptune to satellite #1 is in SEDR word 154.
The range from Neptune to satellite #2 is in SEDR word 155.
The Neptune latitude and longitude of satellite #1 are in SEDR words 141 and 142 respectively.
The Neptune latitude and longitude of satellite #2 are in SEDR words 143 and 144 respectively.

If you have any questions, please contact me at (818) 354-1021 or by electronic mail, JPLGP::NTOY on SPAN or NTOY on NASAMAIL

Or you may call your experiment representative.

Yours truly,


Neil Toy

6/29/90

The following EDR tapes have been processed for Voyager-2.

	EDR block	EDR	LIB block	LIB tape	LIB file
E1 -	15017	CR5 H2504D	15105	066 6/4/90 1:40:10 -	18 → m2w289
ED	15018	CR5A L2698C	15106 15118	066 6/4/90 10:34:34 -	19 23 → m2w287
EP	15019	UV5A C2563B	15107 15119	066 6/4/90 12:4:58 - 19 6/4/90 17:8:10 - 20 6/14/90 10:10:33 - 13:8:9	24 → m2w288

Edr block byte 36 pointer W9 HW2
byte 37 y first entry W10 → 8φ
(41) 11
(45) 12
(49) 13

hcat(1,10) = -32768
hcat(2,10) = 0

Work block byte 25 W7 HW1 Kill 15120 ✓
(m2w286)
15121
15123

edsave 2 CRS32

tell john temporarily mark lib 15116 as ~~done~~ ^{??}
15117

LIB byte 33 → 00 W9 HW1

do not ^{re} use m2w28⁸, 7, 8, 9

put 'scratch' tapes + copy these to them first

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19 June 1990

Dear Colleague,

On June 14, 1990, Voyager 2 returned data in the new UV-5A format. Since there are some differences between UV-5A and the previous VIM-5 format, CR-5T/CR-5A, we have sent you a QEDR tape of the UV-5A data by express shipment.

The QEDR for the UV-5A data covers the period from hour 1430 to hour 1730 (ERT) on day 165 of year 1990. The tape numbers are:

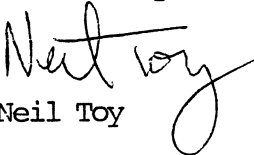
CRS = C2563B	PRA = B2728B (Boulder)
LECP = C2561F	PWS = B2767A
MAG = C2539C	UVS = B2779B
PLS = C2542C	PRA = I2469A (GSFC)

If you have any comments or questions concerning these QEDRs, please contact me at (818) 354-1021 or by mail at

M/S 264-235	U. S. Mail
JPLGP::NTOY	SPAN
NTOY	NASAMAIL

The Project wants a report on the test results of both the UV-5A and CR-5T data back from the science teams by June 27th if possible. Please send your report to me or to your experiment representative.

Yours truly,


Neil Toy

NT:lj

cc: O. Divers
S. Linick
R. Poynter
E. Franzgrote
M. Orr
J. Schmidling
R. Hungerford
G. Textor
G. Spradlin
R. Rudd

CRS: E. Stone
N. Lal
R. Selesnick

LECP: S. M. Krimigis
E. Keath

MAG: N. Ness
R. Lepping

PLS: J. Belcher
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